Brno group of the research centre DAR (coordinated by UTIA, Cz.Ac.Sci. Prague)

/ Department of Biomedical Engineering / Faculty of Electrical Engineering and Communication Technologies / Brno University of Technology

RESEARCH GROUP CONTACT

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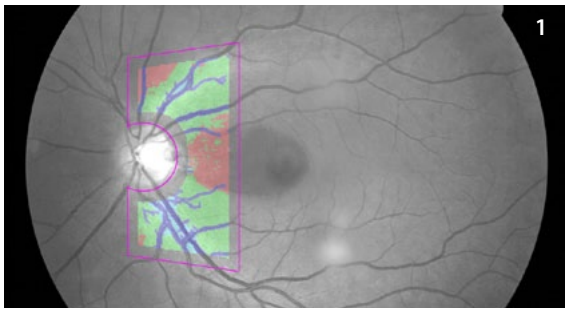

THEMATIC RESEARCH FOCUS

RESEARCH AREA

Medical Image Reconstruction and Analysis

EXCELLENCE

- Ultrasonic computed tomography
- Retinal image analysis
- Analysis of fMRI data for neuroscientific purposes
- Fusion and analysis of multimodal medical image data

MISSION

- Internationally recognized research group in medical image processing, incl. neuroscientific applications

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

Medical Image Reconstruction and Analysis

MAIN CAPABILITIES

- Medical image processing, analysis, reconstruction and restoration
- Authorized ophthalmological software
- Authorized software for 3D CT subtractive angiography

FIELDS OF RESEARCH RESULTS APPLICATION

- Clinical and technological research (routinely usable support of diagnostics)
- Environmental analysis (various image analyses)
- Material microscopy research

NUMBER OF RESEARCH POSITIONS

SENIOR RESEARCH STAFF

4

JUNIOR RESEARCH POSITIONS (INCL. PH.D. STUDENTS)

5

KEY RESEARCH EQUIPMENT

LIST OF DEVICES

- Hardware: powerful parallel computational equipment, connection to GRID resources (cooperation with Masaryk University Brno)
- Software tools for large-scale problems (up to millions of equations)

Photo 1 Human eye retina with nerve fibre layer indications for diagnosis of glaucoma, obtained by digital analysis method developed by Brno DAR group. The red colour indicates tissue damaged by the disease, the green colour indicates the existence of a healthy layer.

Photo 1 Human eye retina with bloodstream, automatically segmented by the method of Brno DAR group for the diagnosis of cardiovascular diseases.

BUDGET

TOTAL (MIL. CZK/ MIL. EUR)

1.8 / 0.072

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

12

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

12

MAIN PROJECTS

2005-2011: DAR - Data, algorithms, decision-making (project 1M0572 financed by the programme 1M - The research centres, Ministry of Education, Youth and Sports)

RELATED PROJECTS OF THE CENTRE:

- Ultrasonic computed tomography (USCT): image reconstruction from measurements, simulation, calibration (cooperation with KIT Karlsruhe)
- Retinal image analysis – evaluation of structures, namely of neural layer and vessel tree, with respect to diagnostic purposes (e.g. for glaucoma) – cooperation with Erlangen University and Hospital
- Medical 3D and 4D image data mono- and multimodal registration (applications e.g. in CT subtractive angiography, in paediatric diagnostics, etc. – cooperation with Philips Nederland)
- Analysis of functional MRI image data for neurological purposes – cooperation with the Faculty Hospital Brno

ACHIEVMENTS

Developed specialised software packages (http://icatb.sourceforge.net/scks/scks_download_links.htm; http://ophthalmo.ubmi.feec.vutbr.cz)

Publications:

- Jan, J.: Medical Image Processing, Reconstruction and Restoration – Concepts and Methods. CRC Taylor and Francis Inc. (USA), 2006, ISBN 0-8247-5849-8, 760 pp.
- Jan, J.: Digital Signal Filtering, Analysis and Restoration. IEE Publishing, London (UK) 2000, ISBN 0-85296-760-8 , 421 pp.
- R. Kolář, R. Laemmer, J. Jan, Ch. Y. Mardin: Segmentation of zones with increased autofluorescence in the junctional zone of parapapillary atrophy. Physiol. Measurement,. vol. 30 (2009) ,pp. 1–12 H.
- HAVLÍČEK, M.; JAN, J.; BRÁZDIL, M.; CALHOUN, V. Dynamic Granger causality based on Kalman filter for evaluation of functional network connectivity in fMRI data. NeuroImage, 2010, vol. 53, no. 1, pp. 65-77. ISSN: 1053- 8119.
- KUBEČKA, L.; JAN, J.; KOLÁŘ, R. Retrospective Illumination Correction of Retinal Images. International Journal of Biomedical Imaging, 2010, no. 5, pp. 201-223. ISSN: 1687- 4188.
- JIŘÍK, R.; PETERLÍK, I.; JAN, J.; ZAPF, M.; RUITER, N. 3D Regularized Speed- Map Reconstruction in Ultrasound Transmission Tomography. In Proceedings of 2009 IEEE Ultrasonics Symposium. Proc. IEEE Ultrasonics
- Symposium. IEEE, 2010. s. 2272-2275. ISBN: 978-1-4244-2428- 3. ISSN: 1051- 0117.

MAIN COLLABORATING PARTNERS

COLLABORATION WITH ACADEMIC PARTNERS

- Friedrich Alexander University (Erlangen, DE)
- KIT (earlier Forschungszentrum), (Karlsruhe, DE)
- Masaryk University, Faculty of Medicine (Brno, CZ)
- UTIA, Academy of Sciences of the Czech Republic (Prague, CZ)

COLLABORATIONSWITH COMPENIES

- Philips Nederland (NL)
- Ophthalmological Clinic, Zlín (CZ)

EXPECTATIONS

REQUIREMENTS

- Academic partners: common scientific interests, potential for common European projects
- Industrial partners: academically formulated technological / medical problems, understanding for publication needs, material support

OFFERS

- Know-how in general and particularly medical image processing, supported by high-tech hardware and software equipment